Use of Artificial Intelligence in Stock Trading

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10 March 2019

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Abstract

Artificial Intelligence (AI) implies the imitation of human intelligence in machines that are programed to think like humans and replicate their actions. *Stock trading* means buying and selling of shares of a particular company. *AI-based stock trading* refers to buying and selling of shares using technology which is programed to act like human being and ensures more accuracy and speed. AI-based apparatuses are already in use to forecast stock market trends. AI not only analyzes data on the stock market, but can also predict stock market trends, trading patterns of investors, stock brokers and the market. Well-renowned companies on Wall Street such as Goldman Sachs and Morgan Stanley have started to focus on narrow AI solutions through data mining, natural language processing, and using self-learning algorithms tools, which are capable of interacting faster than our daily use applications like the Google Assistant of Android, Alexa of Amazon and Siri of Apple. It also helps wealth management companies to keep a constant control on the stock market movement and rebalance the portfolios to ensure the target profit. At present, AI can reduce the work load and save time by performing multiple tasks and provide real-time suggestions but it cannot remove the human involvement entirely.

Keywords: Artificial Intelligence; Stock; Finance; Trading; Forecasting

Introduction

AI has become a transformative force in various industries, revolutionizing the way businesses operate and deliver value to their customers. One industry that has seen significant advancements due to AI is stock trading Aamodt and Plaza (1994). AI has enabled traders to make more informed decisions and improve their trading strategies, leading to higher profits and reduced risks. In this article, we will explore the use of artificial intelligence in stock trading, discussing its benefits, challenges, and future implications. AI-powered stock trading algorithms have gained tremendous popularity in recent years, driven by the increasing availability of big data and the advancements in computational power (Boser et al., 1992). These algorithms use machine learning techniques to analyze vast amounts of financial data, including historical stock prices, company financial statements, news articles, social media sentiment, and macroeconomic indicators. By identifying patterns and correlations, AI algorithms can make predictions about future stock prices and market trends with a higher level of accuracy than traditional trading methods (Chowdhury, 2015; Caruana et al.,2001).

One of the key benefits of using AI in stock trading is the ability to process vast amounts of data quickly and efficiently. Human traders often struggle to analyze the vast amount of information

available in real-time, leading to missed opportunities or making informed decisions based on incomplete data (Chen and Carley, 2018; Chowdhury, 2016). AI algorithms, on the other hand, can process millions of data points within seconds, allowing traders to make more timely and well-informed trading decisions. Moreover, AI algorithms can analyze multiple variables simultaneously and detect complex patterns that are not readily apparent to human traders (Chollet (2015). This ability to identify hidden patterns gives AI-powered trading systems an edge in predicting market trends and making profitable trades. For example, AI algorithms can identify correlations between stock prices and various economic indicators, such as interest rates, inflation, or consumer sentiment. By considering a broader range of factors, AI algorithms can make more accurate predictions and adapt to changing market conditions. Another advantage of using AI in stock trading is its ability to learn and improve over time (Chowdhury et al., 2021). Machine learning algorithms can continually analyze and adapt to new data, refining their trading strategies based on past experiences. This feature allows AI-powered trading systems to become more accurate and effective over time, adapting to changing market dynamics and improving their performance.

Despite the numerous benefits, the use of AI in stock trading also presents certain challenges. One of the main challenges is the potential for overfitting, where algorithms become too specialized in predicting past data but struggle to perform well on new, unseen data. Overfitting can lead to false signals and inaccurate predictions, potentially resulting in financial losses for traders. To mitigate this risk, developers of AI-powered trading systems need to carefully design algorithms and implement robust validation processes to ensure their reliability and performance in real-world trading scenarios (Chowdhury and Islam, 2017). Another challenge is the lack of interpretability of AI algorithms. Traditional trading methods often involve a certain level of intuition and human judgment, allowing traders to understand and explain their decisions. In contrast, AI algorithms can be complex and opaque, making it difficult for traders to understand the reasoning behind their predictions. As AI becomes more prevalent in stock trading, regulators and traders need to develop mechanisms to ensure transparency and accountability in the decision-making process of AI algorithms. Looking ahead, AI is likely to play an even more prominent role in stock trading. The advancements in AI technologies, such as deep learning and natural language processing, are opening new possibilities for analyzing unstructured data sources, such as news articles, social media feeds, and earnings calls transcripts (Chowdhury, 2021). AI algorithms can now extract sentiment, sentiment, and other valuable insights from these sources, providing traders with a more comprehensive view of the market and enabling them to make more informed decisions.

Impact of AI in Stock Trading
Use of AI in stock trading is not something new to the world. Earlier only financially sound, large companies could afford it. The main objective of trading on the stock market is to earn profit. During the decision making process of buying and/or selling of stocks, it does not consider any emotional factors. When human beings include emotions such as greed, fear etc. in decision making process, they end up with wrong decision and pay for it (Chowdhury, 2012). A machine takes quick decisions with highest accuracy considering only the pragmatic factors such as price

variations, macroeconomic data, news on listed companies and government decisions ignoring the emotion. Coalition, an UK based research firm observed that in the wall street, 45 percent revenues from the stock trading is generated by AI driven decisions. AI can alleviate risk by analyzing market fluctuations. It generates new ideas and can create exceptional portfolios by scrutinizing big data. It is also capable of recognizing voice, reading notes in different forms, access multiples versions of data and thus continuously complies the risk assessment standards. Different organizations use AI to establish a platform of intelligence which come up with unique models by interpreting different sets of data. For example, "***Trade Schedule***" is a smart tool used by traders in many Asian stock markets to fix when to buy and sell specific stocks. "***Aidiya"*** is another AI based tool used in Hong Kong to form a hedge fund without any intervention of human being. High-skilled human beings are used to interpret few unmeasurable factors such as sentiments and emotions. Risky transactions can easily be spotted and prevented by applying advanced AI and deep learning (Chowdhury, 2017).

has had a profound impact on the field of stock trading, revolutionizing the way investors make decisions and manage portfolios. With the aid of AI algorithms and machine learning techniques, traders are able to process vast amounts of data quickly and accurately, leading to more informed investment choices. This has resulted in improved efficiency, reduced transaction costs, and increased profitability in the stock market. One of the key advantages of AI in stock trading is its ability to analyze large volumes of information in real-time (Chowdhury, 2021). AI algorithms are capable of monitoring numerous data sources, including financial statements, news reports, social media sentiments, and market trends, to identify patterns and extract valuable insights. This allows traders to react swiftly to market changes, such as fluctuations in stock prices or unexpected events, and adjust their investment strategies accordingly. By leveraging AI, investors can stay ahead of the curve and make more informed trading decisions. Furthermore, AI-powered trading systems are designed to learn and adapt from historical data, enabling them to continuously improve their decision-making capabilities. Through the use of machine learning algorithms, these systems can identify patterns and trends in stock prices and market behavior, as well as recognize the efficacy of certain trading strategies. As a result, AI models are able to fine-tune their predictions and recommendations over time, leading to higher accuracy rates and better trading outcomes. Additionally, AI's impact on stock trading extends beyond decision-making and analysis. AI algorithms have also been utilized to automate trading processes, bringing speed and efficiency to the market. High-frequency trading (HFT), for example, relies heavily on AI algorithms that execute trades at incredibly fast speeds, often in milliseconds. This allows HFT firms to take advantage of even the smallest market inefficiencies and gain profits through rapid and automated trading (Chowdhury, 2022). Moreover, AI has also played a role in reducing transaction costs for investors. By automating trading processes and eliminating the need for human intervention, AI systems have minimized costs associated with human error or emotional biases. These systems can execute trades with precision and remove the potential for human-induced errors, resulting in increased accuracy and reduced transaction costs. Despite the many benefits, it is important to acknowledge that the rise of AI in stock trading is not without its challenges. One major concern is the potential for AI models to exhibit biased behavior. If an AI algorithm is trained on biased or incomplete data, it may perpetuate discriminatory practices or miss important market signals. It is

crucial to ensure that the data used to train AI models is representative and diverse to mitigate these biases.

Use of AI in technical analysis

As technical analysis deals with volume and price movement of stocks, AI and machine learning (ML) can easily be applied. After analyzing the pattern, AI develops an algorithm and can successfully predict the stock index movement. It considers various types of information and handles the data in such a way that it can safely ensure satisfactory return on investment. AI can be used to achieve both short-term and long-term investment goals. It helps to reduce the level of volatility as AI concentrates on data mining and takes decision after analyzing previous algorithm and records. The results generated by using AI and ML are easy to understand and help to make long-term decision.

Artificial intelligence (AI) has found practical applications in technical analysis, transforming the way traders analyze and interpret market data to make investment decisions. Through the use of AI algorithms and machine learning techniques, technical analysts are able to process vast amounts of historical and real-time market data to identify patterns, trends, and potential trading opportunities. This has resulted in improved accuracy, enhanced forecasting capabilities, and more efficient trading strategies (Chowdhury, 2015). One of the practical uses of AI in technical analysis is pattern recognition. AI algorithms are capable of scanning large volumes of historical price data, such as charts and candlestick patterns, to identify recurring patterns that may signal future market movements. These patterns could include head and shoulders, double tops, or triangle formations. By recognizing these patterns, AI models can provide traders with buy or sell signals, allowing them to make well-informed decisions based on historical precedents. Another application of AI in technical analysis is trend identification. Through the use of machine learning algorithms, AI models can analyze price data to identify the direction and strength of market trends. This enables traders to identify and capitalize on upward or downward trends in the market. By following trends, traders can strategically enter or exit positions to maximize profitability (Cover, 2007; (Chowdhury, 2016)). Furthermore, AI can be used in technical analysis to generate forecasts and predictions. By training AI algorithms on historical price data, as well as other relevant market indicators, the models can learn patterns and correlations that exist in the data. This allows the AI models to generate predictions about future price movements, helping traders anticipate market trends and make more accurate trading decisions (Chowdhury et al., 2012). These predictions can provide valuable insights and assist traders in building profitable trading strategies. Moreover, AI has proven to be effective in optimizing trading strategies. Through the use of advanced optimization algorithms, AI models can evaluate and optimize parameters, such as entry and exit rules, position sizing, and risk management, to maximize trading performance (Davenport and Ronanki (2018). This includes strategies such as moving average crossovers, relative strength indicators, or stochastics. By fine-tuning these strategies based on historical data and market conditions, AI models can enhance the profitability and efficiency of trading systems (Chowdhury et al., 2019). However, it is important to note that the practical use of AI in technical analysis comes with its own challenges. One challenge is the potential for overfitting, where an AI model is excessively fit to historical data, resulting in poor generalization to future market conditions. To mitigate this risk, it is crucial to regularly validate the performance of AI models on out-of-sample

data and adopt appropriate validation techniques to ensure the reliability and robustness of the models (Davis and Anderson, 2017). The practical use of AI in technical analysis has transformed the field, providing traders with powerful tools for analyzing and interpreting market data. AI algorithms excel in pattern recognition, trend identification, forecast generation, and trading strategy optimization. By leveraging AI, technical analysts can make more accurate predictions, identify profitable opportunities, and optimize trading strategies for enhanced performance (Esteva et al., 2017; (Chowdhury et al., 2018). However, it is important to monitor and validate AI models to mitigate the risk of overfitting and ensure their reliability. With ongoing advancements in AI technology, the practical use of AI in technical analysis is likely to continue evolving, empowering traders with improved decision-making capabilities.

Future of AI

Data has become the center point of intelligence. Earlier owning physical assets used to be considered as symbol of prestige and status (Lee and Choi, 2020). But now, data has occupied the position of physical assets. Updated data rules everywhere and outperforms people and organizations having old and obsolete data. Data is now used as a weapon to defeat others and to stay ahead in competition. It's not so long when people had very limited access to data, but now, people have very easy access to data. They can analyze the data and take sophisticated decisions by using the same. Most of the organizations in the world now prioritize investment in data management ahead of other operational and managerial needs and demands. According to KPMG, investment in AI will increase from $12.4 billion (2018) to $232 billion (2025). AI will take pro-active decisions rather than that of reactive through deep learning. AI is already being used in fields like healthcare, e-commerce, logistics, supply chain, and transport and it is predicted to be used extensively in stock trading as well. PwC estimates that by 2030, the contribution of AI to the global economy will be up to $ 15.7 trillion. Interestingly, this contribution will be more than the aggregated contributions of both India and China.

Artificial intelligence (AI) has already begun to revolutionize the business landscape, and its future looks incredibly promising. As AI capabilities continue to advance, it is expected to have a profound impact on various aspects of business operations and decision-making. From enhanced automation to improved customer experience, AI is set to transform the way organizations operate and create value. One key area where AI is expected to play a significant role is in automation. AI technologies, such as robotics process automation (RPA), machine learning, and natural language processing, have the potential to automate repetitive and mundane tasks, freeing up human employees to focus on more strategic and creative endeavors (Friedman, 2021). This can result in increased efficiency, reduced operational costs, and faster turnaround times. AI-driven automation has already proven its worth in industries like manufacturing, customer service, and logistics, and its continued adoption in other sectors is expected to reshape business operations. Another significant impact of AI in the future of business is improved decision-making. AI algorithms have the ability to ingest and analyze vast amounts of data from multiple sources, enabling businesses to make more informed and data-driven decisions. With the ability to uncover hidden patterns, correlations, and insights, AI can provide valuable insights for business leaders to optimize their

strategies, identify market trends, and forecast future outcomes. From predicting customer behavior to optimizing supply chain operations, AI-powered decision-making has the potential to unlock new opportunities for growth and competitiveness. Moreover, AI is poised to transform customer experience (Goodfellow et al., 2016). By leveraging AI technologies, businesses can personalize interactions and offer tailored experiences to individual customers at scale. Natural language processing and machine learning algorithms can be used to understand customer preferences, anticipate their needs, and provide personalized recommendations. Chatbots and virtual assistants powered by AI can deliver real-time customer support, reducing response times and enhancing customer satisfaction. As AI continues to advance, businesses will be able to create highly personalized and seamless customer experiences, leading to improved customer loyalty and increased revenue (Gupta and Kapoor, 2020). Furthermore, AI has the potential to revolutionize business analytics and insights. With its ability to process and analyze large volumes of data, AI can derive valuable insights that were previously unachievable. AI-powered analytics can uncover market trends, identify emerging risks, and optimize business processes. By combining AI with technologies like big data and the Internet of Things (IoT), businesses can gain real-time and actionable insights, helping them make informed decisions and stay ahead of the competition. However, it is important to address the challenges and considerations associated with the future of AI in business. Ethical considerations, privacy concerns, and the ethical use of data in AI systems are critical aspects that need to be carefully managed. Businesses must ensure that AI systems are transparent, explainable, and built upon unbiased datasets to avoid perpetuating biases or discriminatory practices. Additionally, addressing the potential impact on employment and workforce displacement is important, as AI-powered automation may change job roles and require new skill sets (Gupta and Pfedder, 2009).

Real Applications of AI in stock trading
The following list contains few companies which use AI for smart trading.

Company	Location	How do they apply?
Trading Technologies	Chicago	It identifies complex trading patterns and reduces compliance risk.
Auquan	London	It uses algorithmic trading strategies which help to solve investment challenges and can save hefty in-house expertise payment.
Epoque	Switzerland	It uses AI as an order engine that creates orders and performs operational actions and uses ML to improve its performance.
Sigmoidal	Poland	It uses AI as an intelligent asset allocation system that uses deep learning to predict every asset in a particular portfolio.
EquBot	San Francisco	The company systematizes the investment process to build a cause-and-effect understanding of markets, companies and management by gathering information from different sources.
AITrading	London, U.K.	The company scans their markets by using blockchain-based smart contracts to increase earnings.

Trade Ideas	San Diego	They use self-learning robo-trading platform which selects only those stocks having 2:1 above profit factor and at least 60% success tracks.
Imperative Execution Inc.	Stamford	They use AI based IntelligentCross which is comprised of experienced traders, analysts and engineers to optimize the trading of U.S. equities
Infinite Alpha	London	They uses AI to facilitate crypto-asset trading. It offers protection to trading professionals via advanced authentication, encryption, hardware security modules and more.
WOA (War of Attrition)	London	They uses AI for real-time market analysis to increase profits for clients who use fund-to-fund, hedge funds, ultra-high net worth individuals and sovereign wealth funds.
Techtrader	San Francisco	They uses a fully autonomous stock trading system that requires no human intervention, adjustments and even updates. It is used to manage hedge fund.
Looking Glass Investments	Milwaukee, Wisconsin	They use AI to find alternative fixed-income investments for clients like family offices, institutional investors and accredited investors.

Source: Builtin, 2020 (4)

Conclusion

A good investment plan helps to extract the best performance from the AI. If the objective is difficult to define and describe, human intervention is a must to modify the combination of decision variables for emotional and unsystematic factors. If all the companies and individuals start using machines to predict stock price movement and to make investment decisions, then the whole market will turn to automated stock market and the market will give us automated return on the investment. In this circumstance, to stay ahead of machine-driven market, we need to explore new knowledge and change our perceptions. the future of artificial intelligence in business holds great promise. From automation and decision-making to customer experience and analytics, AI is set to transform the way businesses operate and create value. With continued advancements in AI, businesses will be able to streamline operations, make more data-driven decisions, deliver personalized experiences, and uncover valuable insights. However, businesses must be mindful of the ethical considerations and potential societal impact of AI adoption. By embracing AI responsibly and with proper governance, businesses can harness the full potential of AI and drive innovation, growth, and competitive advantage in the future.

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